

REMARKS

By this amendment, Applicants amend the specification and claims 1 and 17 to correct minor typographical errors. Claims 1-32 remain pending in the application. Reexamination and reconsideration are respectfully requested in view of the following remarks.

SPECIFICATION

The Office Action objects to the specification because of minor typographical errors. By this amendment, Applicants amend the specification to correct those minor typographical errors.

Accordingly, Applicants respectfully request the Examiner to withdraw his objections to the specification.

CLAIM OBJECTIONS

The Office Action objects to claims 1 and 17 because of minor typographical errors. By this amendment, Applicants amend claims 1 and 17 to correct those minor typographical errors.

Accordingly, Applicants respectfully request the Examiner to withdraw his objections to the claims.

35 U.S.C. § 103

The Office Action rejected claims 1-32 under 35 U.S.C. § 103 over Ooto et al. U.S. Patent 6,215,187 (“Ooto”) in view of Jeng et al. U.S. Patent No. 6,136,643 (“Jeng”).

Applicants respectfully submits that claims 1-32 are all patentable over any combination of Ooto and Jeng for at least the following reasons.

Claims 1 and 17

Among other things, the methods of claims 1 and 17 each feature adjusting the wet etch rate of a lower mold layer by annealing the lower mold layer.

The Office Action states that Ooto discloses such a feature at col. 10, lines 44-49. Applicants respectfully disagree. The cited text reads as follows:

In this structure, on interlayer oxide film **d** containing
45 boron and phosphorus as impurities, interlayer oxide film **5e**
almost free of any impurity such as phosphorus or boron is
formed. Therefore, isotropic wet etch rate of interlayer oxide
film **5d** is higher than isotropic wet etch rate of interlayer
oxide film **5e**. Therefore, when contact hole **50** formed to

Applicants respectfully submit that there is no mention anywhere in the cited text of any annealing step at all, and certainly no mention of any step of adjusting the wet etch rate of a lower mold layer by annealing the lower mold layer. Indeed, Applicants respectfully do not see any such feature disclosed anywhere in Ooto.

Therefore, Applicants respectfully submit that no possible combination of Ooto and Jeng could ever produce the methods of claims 1 and 17.

Also among other things, the methods of claims 1 and 17 each feature dry etching the upper mold layer, the lower mold layer and the etch stop layer to form an opening therein which exposes at least a portion of the surface of the contact plug, and wet etching the upper mold layer and the lower mold layer so as to increase a size of the opening at the lower mold layer and so as to expose a surface portion of the etch stop layer adjacent the surface of the conductive plug.

Applicants respectfully submit that no proper combination of Ooto and Jeng would ever produce a method including such a combination of features.

The Office Action fairly admits that Ooto fails to even disclose the etch stop layer. However, the Office Action states that Jeng discloses etching a layer 36 so as to expose a surface portion of the etch stop layer 32, and that:

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the invention of Ooto so that it would include an etch stop layer as that of Jeng in order to prevent over etching (see the abstract of Jeng).

At the outset, neither claim 1 nor 17 merely recites the “inclusion” of an etch stop layer.

Rather, these claims also recited specific process steps involving such an etch stop layer.

The first one of those steps is dry etching an upper mold layer, a lower mold layer and an etch stop layer to form an opening therein which exposes at least a portion of the surface of the contact plug. Neither Jeng, nor Ooto, nor any combination thereof discloses or suggests such a step. Indeed, Jeng very specifically teaches that it is a “key feature of [their] invention” to form a photoresist mask 34 on the etch stop layer 32 and to then etch the etch stop layer 32, before the dielectric layer 36 is even formed thereon (col. 7, lines 6-20)! So there is no suggestion in Jeng to modify Ooto to dry etch an upper mold layer, a lower mold layer and an etch stop layer to form an opening therein which exposes at least a portion of the surface of the contact plug. Therefore, Applicants respectfully submit that no possible combination of Ooto and Jeng could produce the methods of claims 1 and 17.

The second one of those steps is wet etching an upper mold layer and a lower mold layer so as to expose a surface portion of the etch stop layer adjacent the surface of the conductive plug. Neither Jeng, nor Ooto, nor any combination thereof discloses or suggests such a step. Again, the Office Action states that Jeng discloses etching a layer 36 so as to expose a surface portion of the etch stop layer 32. However, Jeng actually discloses dry etching a layer 36 so as to expose a surface portion of the etch stop layer 32 (col. 7, lines 35-39), while claims 1 and 17 recite wet etching an upper mold layer and a lower mold layer so as to expose a surface portion of the etch stop layer adjacent the surface of the conductive plug. Therefore, once again, Applicants

respectfully submit that no possible combination of Ooto and Jeng could ever produce the methods of claims 1 and 17.

Accordingly, for at least these reasons, Applicants respectfully submit that claims 1 and 17 are patentable over Ooto and Jeng.

Claims 2-16 and 18-32

Claims 2-16 and 18-32 depend, respectively, from claims 1 and 17 and are deemed patentable over Ooto and Jeng for at least the reasons set forth above with respect to claims 1 and 17, and for the following additional reasons.

Claims 11-12 and 27-28

Among other things, the methods of claims 11-12 and 27-28 all include cleaning the surface of the lower mold layer having the adjusted wet etch rate prior to forming the upper mold layer. Meanwhile, in claims 12 and 28, H₂SO₄ is used to perform the cleaning.

Applicants respectfully submit that neither Ooto nor Jeng appear to disclose such features, nor do Applicants see any mention of these features in the Office Action. It is respectfully submitted that the combination of such features together with the remaining features of these claims do not involve the mere selection of "a known material or a known deposition method, . . . or discovering the optimum or working ranges" as alluded to on page 7, lines 2-4 of the Office Action. In the event that the Examiner believes that it would have been obvious to provide the methods of claims 11-12 and 27-28 including such features, a citation to something in the prior art is respectfully requested, including a motivation to modify Ooto and Jeng to include such features.

CONCLUSION

In view of the foregoing explanations, Applicants respectfully request that the Examiner reconsider and reexamine the present application, allow claims 1-32, and pass the application to issue. In the event that there are any outstanding matters

remaining in the present application, the Examiner is invited to contact Kenneth D. Springer (Reg. No. 39,843) at (703) 715-0870 to discuss these matters.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 50-0238 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17, particularly extension of time fees.

Respectfully submitted,

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